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U. S. DEPARTMENT OF AGRICULTURE.

REPORT

OF

THE ORNITHOLOGIST AND MAMMALOGIST

FOR

THE YEAR 1889.

AUTHOR'S EDITION.

FROM THE ANNUAL REPORT OF THE DEPARTMENT OF AGRICULTURE
FOR THE YEAR 1889

PUBLISHED BY AUTHORITY OF THE SECRETARY OF AGRICULTURE.

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REPORT OF ORNITHOLOGIST AND MAMMALOGIST.

SIR: I have the honor to submit herewith my fourth annual report of the doings of the Division of Economic Ornithology and Mammalogy, covering the year 1889. It consists of two principal parts or sections in accordance with the two lines of work carried on by the division—the one, a study of the *Economic Relations* of mammals and birds which are beneficial or harmful from a directly economic stand-point; the other, a study of the *Geographic Distribution of Species.*

Early in the year it was decided to publish the results of the investigations of the division in two distinct series of papers, namely (1) farmers' bulletins; (2) faunal bulletins. Of the former the first number has appeared, entitled, "The English Sparrow in America;" of the latter two numbers have been published, entitled "North American Fauna." Several additional bulletins are now in an advanced stage of preparation and will appear at an early date.

The office force of the Division is wholly insufficient for the rapidly increasing demands of the investigations in hand, and the mere routine work has already outgrown the means at command for its proper accomplishment. The most constant and burdensome element of this work is the correspondence. During the year 1889 about four thousand letters were written, copied, indexed, and mailed, and several thousand circulars and schedules were distributed. Lists were prepared also, or franks written, for upwards of twelve thousand copies of the publications of the division, which have been distributed. During the same time the number of letters received was more than three thousand, and more than half of these were accompanied by schedules, lists, reports, or other records of observations, all of which were examined, indorsed, jacketed, and either filed for future reference or at once utilized in studies already in progress. Other routine work has consisted in comparing and correcting proof, preparing and revising card lists of correspondents, filing certain classes of reports received, type-writing franks for the distribution of documents to American and foreign correspondents, compiling a reference list of publications useful in the regular work of the division, preparing colored diagrams or maps in connection with the work on geographic distribution, and miscellaneous work.

Respectfully,

C. HART MERRIAM,
*Chief of Division of
Ornithology and Mammalogy.*

Hon. J. M. RUSK,
Secretary of Agriculture.

SECTION OF GEOGRAPHIC DISTRIBUTION.

CHARACTER AND OBJECT OF THE INQUIRY.

The primary object of mapping the geographic distribution of species is not only to show the limits of the regions inhabited by each, but also to ascertain the number, positions, and boundaries of the natural faunal and floral areas of the United States—areas which are fitted by nature for the life of certain associations of animals and plants, and which consequently are adapted for the growth of certain agricultural products and for the support of certain kinds or breeds of stock. The results of this study of the natural *life areas* of the country and of the fundamental facts, principles, and laws upon which they depend, are of the utmost value to practical and experimental agriculture, and are so intimately related to the work of the experiment stations that the investigations of the latter can not be fully utilized without them.

In order to understand this clearly it is necessary to bear in mind certain familiar facts which underlie the study of distribution. Everybody knows that polar bears, white foxes, and snowy owls inhabit the Arctic regions; that palm trees, monkeys, and crocodiles are found in the tropics; that cactuses, yuccas, and prairie dogs are characteristic of the arid lands of the West; and that the "big trees," redwoods, and plumed quails of California do not occur east of the Sierras. These are facts of common observation. And so we might go on, dividing and subdividing the lands of North America into major and minor provinces and areas, each of which may be characterized by the possession of many forms of life—associations of species—not found elsewhere.

The reason certain kinds of animals and plants inhabit certain definite parts of the earth's surface and do not occur in other parts where there are no impassable barriers to prevent, is that such species have become adapted, in the course of time, to particular combinations of physical and climatic conditions which prevail over those areas, and their sensitive organizations are not sufficiently plastic to enable them to live under other combinations of conditions.

The recent investigations of the division have demonstrated that mammals and birds and reptiles and insects and plants agree so well in distribution that a map showing the boundaries of an area inhabited by an association of species in one group will serve equally well for other and widely different groups. The reason of this coincidence in distribution in different branches of the animal and vegetable kingdoms over the same area is that all are exposed to the same surroundings and all are governed by the same general laws.

The point of greatest significance, so far as the practical agriculturist is concerned, is that what is true of animals and plants in a state of nature is true also of animals and plants as modified by the voluntary acts of man. Every race or breed of sheep, cattle, or swine, and every variety of grain or vegetable, thrives best under certain definite conditions of temperature, moisture, exposure, and so on. It follows that a map of the NATURAL LIFE AREAS of a country may be used by the farmer for the purpose of ascertaining the boundaries of the areas which are fitted by nature for the growth of certain crops and the support of certain kinds or breeds of stock; in other words, such a map, used in connection with information furnished by the experiment stations, will tell the farmer what he can expect to produce most successfully and profitably on his own farm. Moreover—and this perhaps is of even greater importance—it will tell him what crops will *not* thrive in his neighborhood, thus saving the time and cost of experimental farming, which in the aggregate amounts to hundreds of thousands of dollars every year.

This is but one of the ways in which a knowledge of the distribution of species may benefit the practical agriculturist. It may help him also in his relations with injurious and beneficial species, as he would know beforehand just what species were to be looked for in his immediate vicinity.

RESTRICTIONS IMPOSED BY CONGRESS.

The division is hampered in the study of geographic distribution by the restrictions imposed in the phraseology of the act of Congress appropriating money for the investigations, no provision being made for any work except on mammals and birds. In effect, therefore, the division is prohibited by law from carrying on the most important work it has undertaken, namely, a comprehensive study of geographic distribution, and is prevented from mapping the natural life areas of the country except in so far as this may be done from a study based solely on mammals and birds.

URGENT RECOMMENDATION.

In view of the above facts and of the recent generous expenditures of public moneys for the advancement of related branches of Agricultural science, it would seem the part of wisdom to undertake at once a systematic *Biological Survey* for the purposes above indicated. It is urgently recommended that such a survey be established under the Department of Agriculture, and that the present Division of Ornithology and Mammalogy be merged into it.

WORK OF THE YEAR.

The work accomplished in the section of Geographic Distribution may be conveniently summarized under two heads, namely, (1) office work and (2) field work.

(1) *Office work.*—The office work has consisted in collecting and tabulating published and original records of occurrence, in indicating the same on base maps by means of color spots, and in working up the results of field work conducted by the division.

(2) *Field work.*—The object of the field work of the division is twofold: (1) the collection of material illustrating the geographic distribution of species; (2) the collection of material illustrating the economic relations of species.

During the past year the division has been able to keep but one man in the field continuously, but has employed three others for short periods. Mr. Vernon Bailey has carried out an unbroken line of field work, beginning in Utah and extending through parts of Nevada, Arizona, southern California, and New Mexico. Mr. T. S. Palmer made a six months' trip on the Pacific coast in northern California, Oregon, and Washington. Mr. Charles A. Keeler spent about a month in Nevada. Mr. A. B. Baker was engaged two months in making a trip through northwestern Kansas, western Nebraska, and southwestern Dakota. One member of the office staff, Mr. Morris M. Green, visited the east coast of Florida, remaining there two months. Detailed reports of these explorations will appear later. In the present connection it need only be said that many hundreds of new localities have been added to the geographic ranges of species already known, that many species new to science have been discovered, and that an immense fund of information concerning the food-habits and economic relations of species has been brought together. The specimens collected, after being studied in the division, are deposited in the U. S. National Museum.

Dr. C. Hart Merriam, chief of the division, spent two months in a Biological Survey of the San Francisco Mountain region in north-central Arizona. This proved by far the most important work of the year, resulting in the discovery of many facts of great economic importance, as well as of much scientific interest. The discoveries of most economic consequence relate (1) to the recognition of a number of zones or areas possessing different physical and climatic conditions, and inhabited by different associations of animals and plants; and (2) to the correlation of these zones and areas with those of other localities known to be suited for the growth of particular kinds of crops. As a result of this survey a colored map has been prepared, on the scale of 4 miles to the inch, showing the boundaries of the several zones and areas in sufficient detail for the use of farmers and ranchmen. Timber maps also have been prepared, showing the distribution of the principal forest trees.

The result of most scientific interest is the overthrow of the "Great Central Province" of naturalists by the discovery that the life area heretofore recognized by that name consists merely of a somewhat modified northward extension of the fauna and flora of the Mexican plateau, penetrated by a southward intrusion of boreal forms along the Rocky Mountains.

BIRD MIGRATION.

I regret to state that nothing whatever has been done in the way of working up the vast fund of material on bird migration contributed by the voluntary observers of the division. Many thousands of schedules containing original records of migration are now in hand but can not be utilized, because no funds are available for the employment of an ornithologist to do the work, and the present force of the division is wholly occupied with the more urgent branches of investigation, branches which have a more immediate practical bearing on agriculture.

IDENTIFICATION OF SPECIMENS.

An incidental feature of the work of the division is the identification of natural history specimens sent here for that purpose by farmers and others throughout the country, as well as by the field agents of the division. During the year 1889 more than four thousand specimens were received and identified—a number very much larger than in any previous year. In identifying this material, and in answering the questions which usually accompany the specimens, much useful information is diffused among the people, and the division has come to be regarded as a public bureau of information.

SECTION OF ECONOMIC RELATIONS.

GOPHER INVESTIGATION.

NOTE.—The term Gopher is here used to designate the small mammals variously known as Pocket Gophers, Striped Gophers, Gray Gophers, and Spermophiles. They belong to two widely different families and are included in three genera, namely, *Geomys*, *Thomomys*, and *Spermophilus*.

The gopher investigation may be cited as an illustration of methods of inquiry and of the magnitude of the correspondence and other details of labor necessary in such researches. This inquiry includes, in the case of each of the numerous species concerned, the mapping of its geographic distribution, the nature and extent of the damage it does, the moneys expended in bounties for its scalps, and the methods employed for its destruction. It includes also a scientific study of the status of each species in relation to allied species.

The inquiry was begun in the summer of 1888, when a circular was prepared and distributed asking for information as to the kind and extent of damage done by gophers. More than one thousand one hundred letters on the subject were sent out in that year, and the replies indicated an evil of such magnitude that the investigation was continued during the present year by sending letters and circulars to parts of the country known or suspected to be infested with gophers. One set of these letters related mainly to the presence or absence of the animals, and to the areas inhabited by particular species. About one thousand two hundred and fifty such letters were sent to correspondents in twenty different States and Territories. In addition to these, letters were written to two hundred and sixteen county officers in Dakota, Iowa, and Minnesota, asking for data relating to the bounties paid or other money expended by these counties for the extermination of gophers. In most cases replies were received, further correspondence followed, and already a list of eighty-seven counties has been made in which such bounties have been paid, aggregating about $200,000.

The total correspondence on the gopher evil thus far amounts to two thousand seven hundred and twenty-eight letters or circular letters sent out, and one thousand four hundred and twelve reports received in reply. When it is remembered that hundreds of these letters were accompanied by skins or parts of skins of different species sent for identification, and that the distribution of each species has been provisionally mapped, some idea can be formed of the amount of labor involved in such investigations—and this does not take into account the technical comparison of specimens, including a critical study of their skulls and teeth, the summarizing and tabulating of final results, the collating of original and published records, and the preparation of final maps showing the position and extent of the area infested by each species.

THE ENGLISH SPARROW BULLETIN.

The first of the series of farmers' bulletins published by the division was issued in June, 1889. It treats of the English Sparrow in America, and forms a compact octavo volume of 405 pages. More than eight thousand copies have been distributed up to the end of the year.

Although so short a time has elapsed since its appearance, some of its good effects are visible already, and persons who have tested the recommendations for sparrow restriction and extermination have written the Department detailing their success.

HAWK AND OWL BULLETIN.

An important bulletin on Hawks and Owls is nearly ready for the printer. It treats of the geographic distribution, food, and habits of all the birds of prey which are known to inhabit North America north of Mexico. Of the diurnal kinds (the kites, hawks, falcons, and eagles) thirty-four species and eleven subspecies or geographical races are recognized; and of the nocturnal kinds (the owls) seventeen species and eleven subspecies, making a total of seventy-three.

The accounts of the food habits of the species of most economic importance are as exhaustive as the number of stomachs and the literature of the subject admit, and are accompanied by tables showing the kinds of food found in the many hundreds of stomachs examined.

The species have been arranged in the following categories (subspecies being included under the species to which they belong):

(*a*) Those which are wholly beneficial or wholly harmless (six species);

(*b*) Those which are mainly beneficial (thirty species);

(*c*) Those in which the beneficial and harmful qualities seem to balance each other (nine species);

(*d*) Those which are positively harmful (six species).

Three of the noxious species are of rare occurrence within the limits of the United States.

The bulletin is illustrated by many colored plates of both hawks and owls, and is one of the most important contributions ever made to the study of economic ornithology.

THE CROW.

In last year's report a preliminary study of the Crow was given, with the statement that a bulletin on this subject was in preparation. Work on this bulletin has been carried on as rapidly as possible, but lack of a sufficient number of Crow stomachs, together with the press of other work, has prevented its completion. The discovery made last year that the Crow was largely concerned in the distribution of the seeds of poison ivy (*Rhus toxicodendron*) and poison sumach (*Rhus venenata*) led to other interesting inquiries, and it was found that many other birds, including some of the most beneficial species (namely, bluebirds and woodpeckers), also feed largely on poison *Rhus* berries in winter and so doubtless aid in the spread of these noxious plants. It is probable that some good is done at the same time by planting valuable shrubs and trees, but the relative proportions of good and harm can be determined only after careful examination of the contents of numerous stomachs. In some cases these are already in hand and work on them has been commenced; in other cases they are yet to be collected.

THE CROW BLACKBIRD.

It is intended to issue a bulletin on the Crow Blackbird or Purple Grackle (*Quiscalus quiscula*) at an early date. A mass of data relating to the habits of blackbirds, and particularly to the above species, was collected and partly arranged for publication two years ago, but so many interesting and important questions arose, particularly as to the food of the species, that it was thought best to defer publication until a sufficient number of stomachs could be collected and examined to settle positively some of the important questions at issue. Several hundred stomachs are now in hand and some of them have been examined, but stomachs taken during spring and early summer, as well as those taken in cornfields before the grain has hardened, are much needed still. It is hoped that these may be obtained during the coming season.

POTATO-BUG BIRDS.

Further attention has been given to the bird-enemies of the potato-bug or Colorado Beetle, and a few species beside the Rose-breasted Grosbeak have been found to eat the pest occasionally. Among these is the Yellow-billed Cuckoo, already known as a valuable friend of the farmer because of its habit of feeding upon caterpillars, both smooth and hairy. With the Grosbeak the habit of eating potato-bugs proves to be fairly constant, but unfortunately the bird does not seem to be very abundant anywhere, and hence the resulting benefits have not been generally noticed. Some of our correspondents have suggested that the scarcity of this bird and perhaps of others may be due to the habit of eating insects in places where Paris green has been used, but after careful inquiry we find no warrant for believing such to be the case. We have not been able to learn of a single instance in which any undomesticated bird has been found dead in the vicinity of potato fields under circumstances pointing to this cause. Birds certainly exercise much judgment in selecting their food, and it is not probable that they would eat sickly or dying insects so long as healthy ones were to be found.

SEED COLLECTION.

The importance of a complete reference collection of seeds for use in identifying the contents of bird stomachs becomes more evident every day. Although some additions to the existing collection have been made during the year, partly through the efforts of members of the division and partly through co-operation with the botanist, much still remains to be done.

COLLECTION OF BIRD STOMACHS.

The collection of bird stomachs has been increased during the year by the addition of eight hundred and seventy-two stomachs, and now numbers ten thousand seven hundred and sixteen. These are preserved in alcohol, mainly in separate vials. During the past two years this entire collection has been moved and re-arranged four separate times, each removal from one room or building to another resulting inevitably in more or less confusion, delay, and extra work. It is hoped that the new laboratory of the division where they are now arranged may prove ample, at least for those which are awaiting examination. Up to the present time it has been possible to examine finally only about two thousand of these stomachs, though the preliminary examination of about five hundred more has been made.

The economic work of the division is seriously hampered at present by the lack of funds to employ specialists to carry on the investigation, and one of its most urgent needs is a competent biologist to do this work—one familiar both with modern microscopical technique and practical systematic botany and zoology.

MARSH HAWK.

Circus hudsonius.

By Dr. A. K. Fisher.

This well-known hawk inhabits the whole of North America, breeding north to Alaska and the fur countries, and wintering from about latitude 40° N., south to Panama and Cuba. A representative species (*Circus cyaneus*) occurs throughout most of temperate Europe and Asia, wintering in the more southern portions as well as in northern Africa.

The Marsh Hawk breeds in suitable localities everywhere from the southern border of the United States to the northern limit of its range, being most common through the prairie country of the West. In the case of a species of such extended distribution the time of nesting is very variable. Thus while in Texas the eggs are to be found by the latter part of April, in the fur countries it is the middle of June before they are deposited.

The nest is always placed on the ground, usually in a marsh or prairie grown up with tall rushes, grass, or bushes, and not far from water. It is commonly situated at the base of a bush, or in localities subject to inundation, on the top of a tussock. It is composed chiefly of dry grass loosely thrown together and strengthened by the incorporation of a few dead sticks, and as a finishing touch a sparse lining of feathers is added. When the same site is used for several years in succession the accumulated mass of material often forms a platform of considerable size.

The number of eggs in a set is usually from four to six, though as many as eight have been found. As with most of the hawks, the period of incubation is about four weeks. The male assists the female in the construction of the nest, in incubating the eggs, and in procuring food for the young. During the period the young are being fed the male often drops the food to the female from a considerable height, as he passes near the nest, she darting upward and catching it before it reaches the ground.

This hawk is very zealous in protecting its young from intruders and has been known to attack persons or dogs who have entered its domain. After the young are reared and leave the nest they remain together, and as fall advances several families unite and migrate southward. Hence it is not unusual to see forty or fifty individuals at one time scattered over the more extensive marshes.

Though the flight of this hawk lacks the elegance of some of the other species, it is well sustained and often protracted. When the bird is beating back and forth over the meadows in search of food the flight is easy, regular, but not rapid, and resembles closely that of some of the herons. In the spring the male sometimes goes through a series of aerial evolutions which are highly amusing. While at a considerable altitude it throws its wings over its back, and falling perpendicularly several yards turns over and over much like a tumbler pigeon until near the ground when it ascends rapidly again to repeat the performance.

When prey is discovered the hawk poises for a moment over the spot and then drops quickly on it, and if unsuccessful is sure to beat over the same place before leaving. It generally devours its quarry on or near the spot where captured, instead of carrying it away. Its food consists largely of small rodents, such as meadow mice, half-grown squirrels, rabbits, and spermophiles or ground squirrels. In fact, so extensively does it feed on the last-named animals that the writer rarely has examined a stomach from the West which did not contain their remains. In addition to the above it preys upon lizards, frogs, snakes, insects, and birds; of the latter, the smaller ground-dwelling species usually are taken. When hard pressed it is said to feed on offal and carrion; and in spring and fall, when water fowl are abundant, it occasionally preys upon the dead and wounded birds left by gunners. It seldom chases birds on the wing, though the writer has seen it do so in a few instances.

In speaking of the food of the Marsh Hawk, Audubon says:

> The food of the Marsh Hawk consists of insects of various kinds, especially crickets, of small lizards, frogs, snakes, birds, principally the smaller sorts, although it will attack partridges, plovers, and even green-winged teals, when urged by excessive hunger (Vol. IV, p. 400).

Mr. H. W. Henshaw, whose great field experience in the West enables him to speak authoritatively on the subject, says:

> They were seen at all hours of the day * * * in search of mice and gophers, which, when obtainable, constitute the major part of its food. When urged by hunger, it may attack birds; and I once remember to have been robbed of a widgeon I had killed and kept lying in the water, by one of these birds; but generally they confine their attacks to the humblest kind of game, which possesses neither the strength to enable them to resist nor the activity to evade the sudden descent of their winged enemy. (Ornith. 100 Merid., 1875, p. 416.)

Dr. Coues says:

> It ordinarily stoops to field mice, small reptiles, and insects. It is particularly fond of frogs. (Birds of the Northwest, p. 331.)

Mr. Ridgway, in the Ornithology of the Fortieth Parallel (p. 580), states that the stomachs and crops of specimens killed at Pyramid Lake were filled to their utmost capacity with the remains of small lizards, and nothing else.

Dr. B. H. Warren gives the following summary of his investigations on this species:

> In fourteen examinations made by myself, seven hawks had only field mice in their stomachs; three, frogs; two, small birds (warblers); one, a few feathers, apparently of a sparrow (*Melospiza*), and fragments of insects; one, a large number of grasshoppers with a small quantity of hair, undoubtedly that of a young rabbit. (Birds of Pennsylvania, 1888, p. 75.)

There is another way in which it protects crops, albeit unconsciously, as appears from the following:

> It is also said to be very serviceable in the Southern rice-fields in interrupting the devastations made by swarms of bobolinks. As it sails low and swiftly over the fields it keeps the flocks in perpetual fluctuation, and greatly interrupts their depredations. Wilson states that one marsh hawk was considered by the planters equal to several negroes for alarming the rice-birds. (Hist. N. A. Birds, Vol. III, p. 218.)

Dr. Merriam bears witness to the truth of the foregoing, for while at Georgetown, S. C., he saw an immense flock of bobolinks driven from a field by one of these hawks which simply passed over at a considerable height, and made no movement to molest them.

Although this hawk occasionally carries off poultry and game birds, its economic value as a destroyer of mammal pests is so great that its slight irregularities should be pardoned. Unfortunately, however, the farmer and sportsman shoot it down at sight, regardless or ignorant of the fact that it preserves an immense quantity of grain, thousands of fruit trees, and innumerable nests of game birds by destroying the vermin which eat the grain, girdle the trees, and devour the eggs and young of the birds.

The Marsh Hawk is unquestionably one of the most beneficial as it is one of our most abundant hawks, and its presence and increase should be encouraged in every way possible, not only by protecting it by law, but by disseminating a knowledge of the benefits it confers. It is probably the most active and determined foe of meadow mice and ground squirrels, destroying greater numbers of these pests than any other species, and this fact alone should entitle it to protection even if it destroyed no other injurious animals.

COMMON SCREECH OWL.

Megascops asio.

By Dr. A. K. Fisher.

The little Screech Owls are distributed over the temperate parts of the globe and are among the better known of the owls. Their food consists of a great variety of animal life, including mammals, birds, reptiles, batrachians, fish, crustaceans, and insects. At nightfall they begin their rounds, inspecting the vicinity of farm houses, barns, and corn-cribs, making trips through the orchard and nurseries, gliding silently across the meadows or encircling the stacks of grain in search of mice and insects. Thousands upon thousands of mice of different kinds thus fall victims to their industry. Their economic relations therefore are of the greatest importance, particularly on account of the abundance of the species in many of the farming districts, and whoever destroys them through ignorance or prejudice should be severely condemned.

In winter many have noticed the tracks of mice which often form networks in the snow, crossing and recrossing, passing in and out of walls and stacks, or converging toward some choice bit of food—all tending to show how active these little rodents are during the period when most of the world sleeps. Occasionally a track stops abruptly, and while the observer is trying to read more of the history written in the snow, his eyes catch the faint impression of a pair of wing tips near where the trail ends, and instantly he is made aware that a tragedy has been enacted. Beside the different species of mice, the Screech Owls feed on other small mammals, as chipmunks, shrews, moles, and occasionally bats. During warm spells in winter they forage quite extensively and store up in their homes considerable quantities of food for use during inclement weather. It may be said in this connection that with one exception the only specimens of pine mice ever procured in southern New York by the writer were taken from the store-houses of these owls.

Frogs are devoured greedily, while other batrachians and small reptiles are occasionally eaten. Crawfish are sometimes found among the stomach contents, but not so often as in the case of the barred owl. Evidence goes to show that at times this owl is an expert fisherman. Capt. Charles E. Bendire found it feeding on fish in the Northwest, and the following note by Mr. M. A. Frazer shows that it will sometimes travel a long distance for this food:

> On November 29, 1876, I took from a Mottled Owl's hole (*Scops asio*), the hinder half of a woodcock (*Philohela minor*). Within two weeks after I took two owls from the same hole, and on the 19th of January last I had the good fortune to take another. After extracting the owl I put in my hand to see what else there was of interest, and found sixteen Horned Pouts (*Amiurus atrarius*), four of which were alive. When it occurred to me that all the ponds in the vicinity were under at least 2 feet of snow and ice, I could scarcely conjecture where the Horned Pouts could have been captured. After visiting all the ponds, I found they had most probably been captured in one fully a mile away, where some boys had been cutting holes through the ice to catch pickerel bait. The owl probably stationed himself by the edge of the hole and seized the fish as they came to the surface. What a busy time he must have had flying 32 miles after sixteen Horned Pouts. (Bulletin of the Nuttall Ornithological Club, Vol. II, No. 3, July, 1877, p. 80.)

Mr. Willard E. Treat, of East Hartford, Conn., speaking of this habit, says:

> I secured a Screech Owl February 2, 1889, which was caught in a steel trap, the latter having been set in a spring where there were a number of small fish. When found it was dead, having been drowned, and its legs were more or less covered with fish scales. The trap was at least 4 or 5 inches below the surface of the water, which seems to show that the Owl must have plunged into the water in order to have got caught. This is the only instance in which I have known this species to enter the water for the purpose of securing fish. (The Auk, Vol. VI, 1889, p. 189.)

No species except the burrowing owl is so destructive to noxious insects as this; grasshoppers, crickets, and a number of night-flying beetles are devoured with relish. The stomachs of two young birds which had recently left the nest were found distended with May beetles. Prof. Samuel Aughey found remains of insects in all the specimens he examined in Nebraska, and states: "It is largely an insect-eating bird." Dr. B. H. Warren says: "During the summer months and at other times when insect life is abundant the Screech Owls subsist mainly on an insect diet." (Birds of Pennsylvania, 1888, p. 115.)

During the years 1884 and 1885, Mr. Charles Dury received at least sixteen specimens from the vicinity of Cincinnati; twelve of these, including one killed in January, contained remains of insects.

Writers almost universally speak of the Screech Owl as a beneficial species:

> It preys on mice, small sparrows, etc., and very often catches nocturnal beetles and other insects. It thus destroys a large number of field-mice, and the large cockchafer, so injurious to our fruit trees. In winter it familiarly enters our barns and outhouses, where it becomes an expert and industrious mouser. (Dr. E. Michener, U. S. Agricultural Report, 1863, pp. 291, 292.)
>
> The food is chiefly small quadrupeds, insects, and occasionally, when they have young, small birds. They destroy a vast number of mice, beetles, and vermin, and are of great service to the agriculturist. (Baird, Brewer & Ridgway, History of North American Birds, Vol. III, p. 57.)
>
> After dark it is all alive; not a mouse can stir without being observed, and so quick and noiseless is the flight of the bird that few escape which expose themselves. (McIlwraith, Birds of Ontario, 1886, p. 158.)
>
> A large number of castings of this species were examined on various occasions, and found to be composed almost entirely of the fur and bones of meadow and white-footed mice; with feathers of bluebird and some sparrow in several cases; and sometimes insects. (Mr. J. Percy Moore, in epist.)

Unfortunately we can not shut our eyes to the blacker pages of its history, and it must be said that occasionally it is destructive to small birds, especially during the breeding season when it has a number of hungry mouths to fill, and also in suburban districts where its favorite food is hard to procure. Mr. Morris M. Green found the remains of a house wren in a hole containing five young screech owls; and Nuttall says:

> In the hollow stump of an apple tree, which contained a brood of these young owls, were found several bluebirds, blackbirds. and song sparrows, intended as a supply. (Land Birds, p. 121.)

Sometimes it kills birds fully as large as itself. In one of its holes the writer once found the remains of a quail; and a woodcock has been mentioned as found in a similar situation. In a few instances it has been known to kill and eat one of its own kind. When suffering from the pangs of hunger it occasionally attacks barnyard fowls.

> About 3 o'clock on last Friday afternoon a common little Screech Owl flew into a large barnyard in this neighborhood and alighted on the back of a large hen, several times as large as itself, attempting to carry it off. The claws of the owl got entangled in the feathers of the frightened hen, and the owner of the farm was enabled to catch it. * * * There was scarcely any flesh on its bones and no signs of food in its stomach. (Night Hawk, Forest and Stream, Vol. XX, March 8, 1883, p. 106.)

Unfortunate as this bird-catching habit seems to be, it may be ranked as an important factor in the bird's favor. Since the introduction of the noxious English sparrow, and its alarming increase in our cities and villages, experience has taught the little Screech Owl that this sparrow is a delicate and easily obtainable food. Many times at dusk has this owl been seen hovering about the ivy mantled churches or thick shrubbery of the parks in search of sparrows, and still more positive evidence is furnished by the remains of English sparrows which have been found in the stomachs of owls shot in such localities.

This species breeds throughout its range, and does not migrate or even wander far during the winter months. It almost invariably nests in the hollows of trees, usually not over 10 feet from the ground; in inhabited sections old apple orchards are favorite resorts. Occasionally it has been known to breed in holes in buildings as well as in dove-cotes, but never in nests among the branches of trees, as is the habit of some other owls. Captain Bendire once found a pair of them breeding near Fort Walla Walla in the same tree with a pair of sparrow hawks, and there seemed to be perfect harmony between the birds although their holes were only about 2 feet apart. (Ornithologist and Oologist, Vol. VI, 1881, p. 21.)

In the following case noted by Mr. F. Stephens the relations of the species were somewhat strained. Mr. Stephens states:

> On April 19, I heard a screaming noise proceeding from a woodpecker's hole in a pine. I climbed the tree, and pulled out a female McCall's Owl, and immediately after a male sparrow hawk flew out. The owl was apparently breeding, but the hole contained no eggs. (Bull. Nuttall Ornith. Club, Vol. III, 1878, p. 94.)

Evidently the hawk had been looking for a nesting site and had entered a tenanted one by mistake.

There never seems to be much of an attempt to form a nest; usually the cavity is incompletely lined with a few feathers from the parent bird, but this is by no means universal. The eggs, from three to six in number, are placed in the bottom of the cavity in the rotten wood and other material accidentally occurring there. In the South they are deposited in the latter part of March, while in the more northern States full sets are rarely found before the middle of April. If the cavity is large enough the male usually remains with the female during the day while she is sitting on the eggs; if it is not of sufficient size to accommodate both, he may be found in a neighboring hole or copse. About one month elapses from the time the first egg is deposited until the young hatch, and these remain in the nest about the same length of time. Mr. F. H. Carpenter had a pair breed in confinement, and gives the length of incubation as twenty-two days. (Ornithologist and Oologist, Vol. VIII, 1883, pp. 93–94.) In the latter part of May or first of June, families composed of old and young sometimes may be started at dusk from the clumps of bushes bordering streams, or in the vicinity of old orchards.

The little Screech Owl is one of the most nocturnal of our species, seldom moving out of its retreat until twilight. Its flight is regular, and when indistinctly seen in the dusk it much resembles that of the woodcock. If suddenly started on a bright day it flies around in a bewildered manner but soon becomes accustomed to the light and apparently sees perfectly well. During the day it usually remains hidden in the hollows of trees or more rarely among the thick foliage. Here it is occasionally espied by some keen eyed songster in search of food. The little bird is not slow in making its discovery known to others in the neighborhood, who at the first note of alarm hurry to the spot. Soon an irritated mob, including perhaps a dozen species, surround poor *Megascops* and make life so uncomfortable that he is forced to seek another place, only to be followed and harassed by his tormentors. To escape these he chooses the dark cavities in hollow trees in preference to other and less secure hiding places.

During cold weather in the north it not unfrequently inhabits barns. Mr. McIlwraith, of Hamilton, Canada, states: "During some winters there is scarcely a farm in the country which has not its Screech Owl in the barn." (Birds of Ontario, 1886, p. 157.)

When kept in confinement the Screech Owl is one of the most interesting of pets, and although not so active on bright days as might be desired, it is usually so kind and affectionate as to fully compensate for its sluggishness. It soon learns to take food from the hand, and will allow a moderate amount of handling by its master. It is very fond of water and will drink or bathe eagerly when a fresh supply is placed in the cage. Once about dusk the writer came upon a small family which had emerged the moment before from the water. They were sitting on some low alders over a shallow portion of the stream, ruffling up and shaking the water from their feathers, and presented a soaked and forlorn appearance. Apparently they were too wet to be able to fly well, for when approached they fluttered off heavily into the thicket and soon escaped from sight in the growing darkness. The number of times this owl has been drowned in water barrels indicates its fondness for bathing. The following note by Mr. A. W. Anthony, of an incident in Washington Territory, unquestionably refers to a bird caught while attempting to bathe:

> One was caught in a steel trap set in a deep, narrow ditch. As the trap was sunk at least 4 inches under water, and was not baited, it is a puzzle to me how the bird was caught. (The Auk, Vol. III, p. 165.)

The low, wailing, moaning notes of this owl are not loud, but their character enables them to be heard a considerable distance; they suggest, without resembling, those of the common dove. They may be heard at any time from dusk to dawn, and on rare occasions in the day-time.

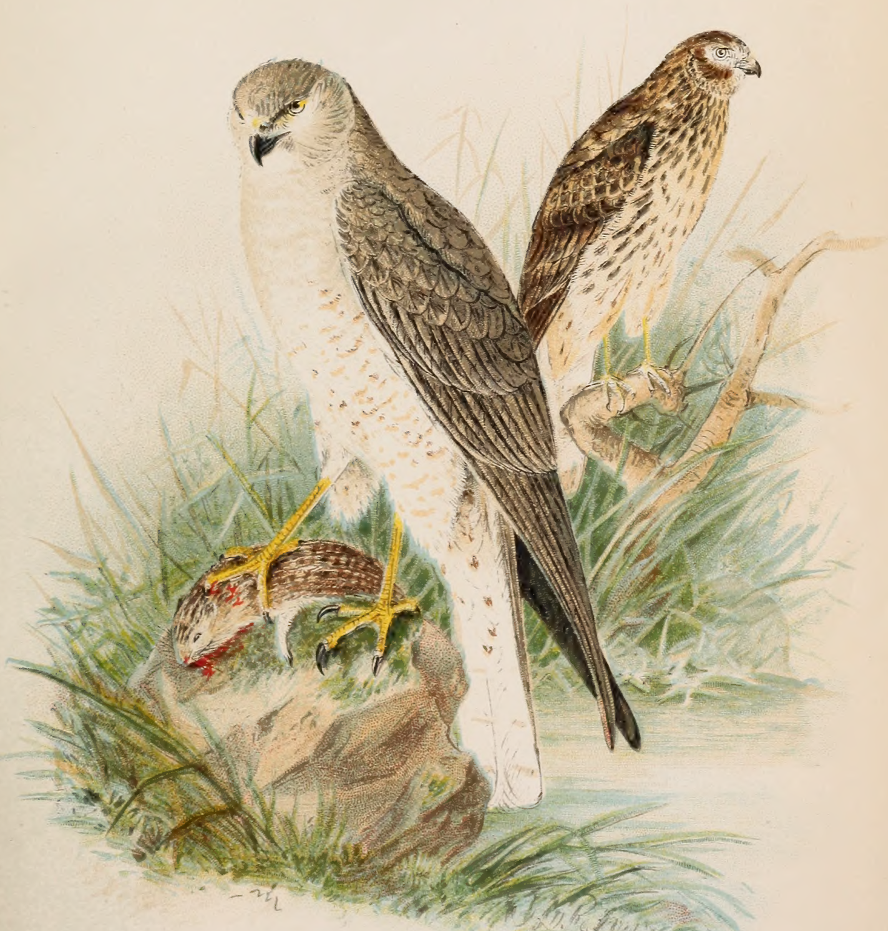
The Common Screech Owl is distributed throughout the whole of the United States and southern portions of the British provinces. It is separable into several geographic races, as usual in species having a like extensive distribution. The typical form (*Megascops asio*) ranges from the eastern United States and British provinces south to about the thirty-fifth parallel and west to the Great Plains. The Florida Screech Owl (*Megascops asio floridanus*) inhabits the Gulf States from Louisiana to Florida, and extends north to South Carolina. The Texas Screech Owl (*Megascops asio mccallii*) is found in southern Texas and eastern Mexico and south to Guatemala. The Mexican Screech Owl (*Megascops asio trichopsis*) inhabits northwestern Mexico, Arizona, New Mexico, and Colorado. The California Screech Owl (*Megascops asio bendirei*) is limited to California. Kennicott's Screech Owl (*Megascops asio kennicottii*) inhabits the Northwest coast, from Oregon to Sitka, and east to northern Montana. The Rocky Mountain Screech Owl (*Megascops asio maxwelliæ*) is found in the higher Rocky Mountains, from Colorado to eastern Montana.

FLAMMULATED SCREECH OWL.

Megascops flammeolus.

This owl inhabits the highlands of Central America and Mexico, ranging northward into the United States as far as California and Colorado. It was first captured within our limits at Fort Crook, California, in August, 1860, and at the present time is one of the rarest owls in the United States. More specimens have been taken in Colorado than in all the other States, and so far this is the only region where it has been found breeding.

From the little that is known of its habits it is presumed that they do not differ in any marked degree from those of the Common Screech Owl. Its food also is probably the same, although the only data we have on this subject is the result of an examination, made by Dr. C. Hart Merriam, of the stomach contents of a specimen killed by him in the Grand Cañon of the Colorado, September 13, 1889. Its stomach contained one scorpion, some beetles, and a few other insects.



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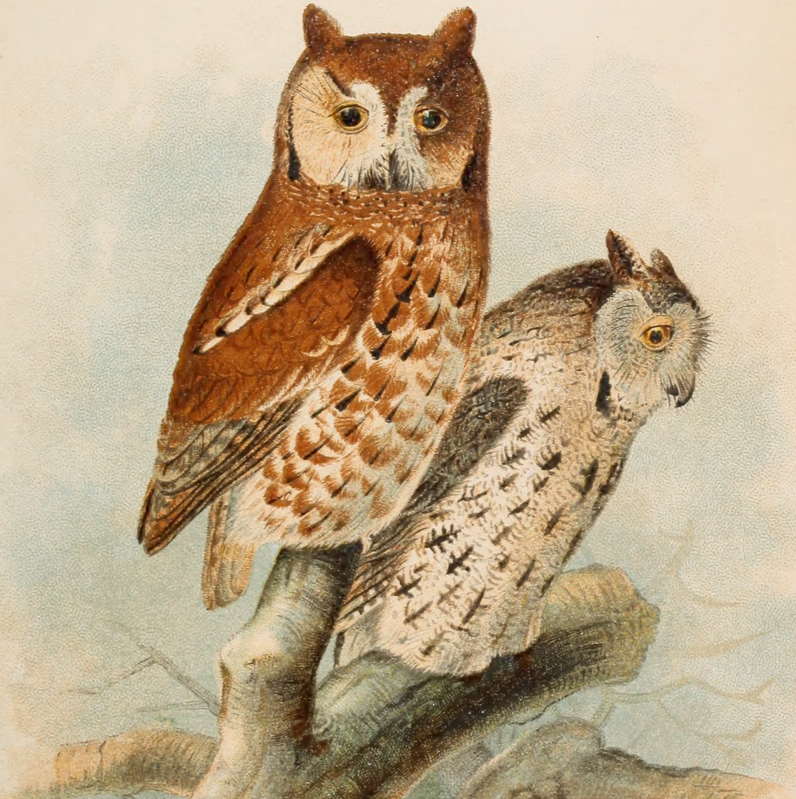
MARSH HAWK.

(Circus Hudsonius.)



SCREECH OWL.

(Megascops asio.)